DOCUMENT RESUME

ED 204 714 CS 006 150

AUTHOR	Jones, Virginia W.
TITLE	Decoding and Learning to Read.
INSTITUTION	Northwest Regional Educational Lab., Portland, Oreg.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C.
PUB DATE	May 70
NOTE	70p.
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	*Beginning Reading; *Decoding (Reading); *Phoneme Grapheme Correspondence; Phonemes; Primary Education; *Reading Instruction; *Reading Research; Structural Analysis (Linguistics); *Syllables
IDENTIFIERS	*Graphonemes

ABSTRACT

The three articles in this monograph describe and analyze the graphoneme (a closed syllable that begins with a vowel and ends with a consonant, semivowel, or silent "e") and its usefulness in the teaching of reading. The first article discusses the graphoneme concept as a systemized approach to initial reading instruction, while the second article describes a reading and language development project that used materials based on research related to graphonemes. The third article details a study that surveyed the vocabulary of elementary school children in order to determine which graphonemes should be taught in a program of initial reading instruction. The word sample used in the study is appended. (FL)

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Decoding and Learning to Read

Virginia W. Jones

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CS 206150

The Phonogram Method © 1963
by Virginia W. Jones

The Graphoneme Concept © 1967
by Virginia W. Jones

May 1970

Published by the Northwest Regional Educational Laboratory, a private nonprofit corporation supported in part as a regional educational laboratory by funds from the United States Office of Education, Department of Health, Education and Welfare. The opinions expressed in this publication do not necessarily reflect the position or policy of the Office of Education, and no official endorsement by the Office of Education should be inferred.

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FOREWORD

In this monograph Virginia Jones challenges the validity of an otherwise authoritative notion that it is inadvisable to teach phonograms--or "graphonemes"--to children in elementary schools. The notion is traceable back to the writings of the late E. W. Dolch in the late 1930's. Dolch contended then that "phonograms are of doubtful help in the attack on polysyllables that is essential for independent reading at all levels."[1] An influential American reading authority, William S. Gray, repeated Dolch's warning almost verbatim: "If a child tries to 'sound out' the words on the basis of letter combinations that he has been taught as phonograms, he will all too frequently be misled."[2] Anna D. Cordts discards any system that teaches phonograms into her wastebasket of "other methods,"[3] while George Spache would not teach phonograms until grade three.[4] Although these attitudes continue to influence present practices in the teaching of reading, they are held to be true today by fewer reading experts than in the decades when Dolch exercised his leadership.

Two questions must be answered to resolve the controversy of whether or not phonograms--or graphonemes--are useful in the teaching of reading.

1. Is it legitimate to separate polysyllabic words into syllables according to the practice of a standard dictionary, and then to determine if the phonograms common to single syllable words also are found in the syllables taken from polysyllabic words?

2. Do children in an experimental tryout actually--not theoretically--advance their reading skills when taught with the Graphoneme Concept?

In an attempt to answer the first question, Dolch went through the process of separating words into syllables as done by a standard dictionary, and then determining if the phonograms, common to single syllable words, were also found in the syllables taken from the polysyllabic words. He found that common syllables appeared in only 39 percent of the syllables taken from polysyllabic words. Accordingly, Dolch concluded that there was doubtful value in the use of phonograms.

But it is during the process of such division and comparison that a grave error is made in judging the usefulness of phonograms. The separation of polysyllabic words according to the practice of a standard dictionary is wrong. Linguists agree with Robert A. Hall that "the syllable is perhaps the most extensively discussed of phonetic phenomena, and at the same time that on which there is the least agreement among phoneticians."[5] Above all, they decry the use of dictionary syllabication. As Ronald Wardhaugh states, dictionary "division points have largely evolved through many years of concern with proofreading, typesetting, laying out written words as attractively as possible and breaking words at line ends."[6] Dictionaries have chosen to ignore, on the other hand, the phonetical, morphological and acoustical evidence on syllabication. The Graphoneme Concept does not involve dictionary syllabication.

The second question above can be answered by examining the preliminary reports on the effectiveness of the reading materials written by Virginia Jones. The materials, which are intended to teach reading to Alaskan native children in grades one to three, utilize the Graphoneme Concept. Every report thus

far indicates a significantly greater improvement in reading skills with these materials than with previously used readers. Although the specific cultural content doubtless accounts in some measure for this success, I believe that the Graphoneme Concept taught in these materials supplies a more fundamental reason for their success.

Thus, this monograph, which describes and analyzes the graphoneme and its usefulness in the teaching of reading, is pertinent to the times: "Today, 7,000 years after man first began to record his ideas in writing, the ability to read has become an absolute necessity for everyone."[7]

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ACKNOWLEDGMENTS

The author gratefully acknowledges the contributions of the following persons who assisted in the development of theory and the structure of research procedures, and who have been continually supportive:

Dr. George T. Gabriel, Director of Research, Baltimore County Public Schools, Towson, Maryland

Dr. Patrick J. Groff, Professor of Education, San Diego State College, San Diego, California

Dr. Loyal W. Joos, Director of Systematic Studies, Oakland County Schools, Pontiac, Michigan

Dr. William B. McColly, Professor of Education, State University College, Oswego, New York

Dr. Robert R. Rath, Coordinator of Planning, Northwest Regional Educational Laboratory, Portland, Oregon

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PART I

The importance of decoding as the initial skill in learning to read cannot be underestimated. Before dealing with the problems of literal comprehension or interpretation or critical thinking, the child must be able to unlock those groups of contiguous symbols which are called words. Perhaps the greatest need in the field of reading today is for research designed to produce more efficient means of decoding.

Unfortunately, such basic research has too often been neglected in our haste to capitalize on the current popularity of decoding, and consequently we find a plethora of "new" materials designated "linguistic" which are new in name only.

The paper which follows describes the theory and the methodology which resulted from a research project conducted in Baltimore County, Maryland 1963-1966. The decoding procedures evolved are now being employed in the teaching of reading in the state of Alaska.

THE GRAPHONEME CONCEPT

A Systematized Approach to Initial Reading Instruction

INTRODUCTION

Since reading is one of the most complicated processes which must be mastered by pupils in the elementary school, the teaching of reading has been the subject of thousands of expositions, each attempting to discover some magic formula which will reduce the myriad complexities involved in the reading process to some simplified essence from which our children may acquire the skill. Time, trial, and experience have shown us that seldom is there ever any one way of accomplishing a given task. We have further learned that because of the limitless variations among human beings, even the best of methods employed in reaching a stated goal usually fail to meet the needs of every individual.

Therefore, no claim is made that the teaching of graphonemes provides a panacea for reading instruction. The proven success of this method can probably be attributed to the fact that it is based upon several generally accepted concepts regarding the learning process and the nature of the English language.

1. Learning best occurs when the teaching modules move from simple to complex, from concrete to abstract, from that which is regular to that which is exceptional.

2. The purpose of initial reading instruction should be to furnish pupils with sets of skills which will foster successful independence in reading.

3. The English language is fundamentally stable in its grapheme-phoneme reproduction.

WORD RECOGNITION SKILLS

Even though reading is essentially a thought-getting process, the ability of the individual to recognize and attach meaning to printed symbols as they are grouped into words is fundamental to the ability to read. The young child has heard spoken language all his life and has used language as a tool of communication himself. It is the purpose of the initial reading instruction received at school to enable the child to recognize language in written form.

The teaching of word recognition usually involves the development of several skills:

1. Recognition of basic sight vocabulary
2. Use of context clues in analyzing unknown words
3. Phonics
4. Structural analysis

Teaching the Sight Vocabulary

Much of the methodology employed in beginning reading relies heavily upon the sight method. This is not unnatural, since this enables beginning readers to quickly verbalize comparatively large numbers of words in a short period of time. Some English words like the, of, there, who, etc.

cannot, for all practical purposes, be learned in any other way. The disadvantage of such methodology is that the learning of whole words provides little carry-over for future independent word analysis.

Using Context Clues

Context clues serve a useful purpose in the derivation of meaning, but this pre-supposes knowledge of other words in the sentence or passage. Such clues provide little help for the child whose background of experiences is limited. Even pictures in the texts may display ideas unrelated to the life situations of our pupils. The third disadvantage of context clues lies in the fact that words whose pronunciation has been so derived are usually soon forgotten. Over-emphasis upon this practice can result in making reading a kind of guessing game.

Phonics

The teaching of phonics has become one of the most controversial topics of our time. No method of reading instruction can ignore phonics, for words are composed of a clustering of written symbols representing speech sounds. Reading must translate the visual form back into its auditory counterpart. However, a purely phonetic methodology becomes so complicated, so engrossed with rules and exceptions to rules, so fragmented, that it frequently causes the reader to lose sight of that prime purpose of all reading, deriving meaning. Pupils who learn by this method tend to become hampered by excessive numbers of small modules, and confused when letters do not always say the sounds pupils have been taught they are supposed to say.

Structural Analysis

Structural analysis has probably been the most neglected of all the skills brought into focus when teaching word recognition. Historically, this area of word attack has primarily concerned itself with affixes. Little attention has been paid to the structure of the root word itself. The Graphoneme Concept deals with the structure of root words.

THE GRAPHONEME CONCEPT

Grapheme-Phoneme Stability

Linguists and reading specialists alike have long recognized that the task of learning to read would be much simpler if English words were regular in their spelling and in their sound-symbol relationships. We have an alphabet of twenty-six symbols (graphemes), but these actually represent forty-four speech sounds (phonemes). The logic of this desire for stability becomes apparent when one examines the vocabulary which commonly confronts the beginning reader:

"Come home, Bill."

"What is that?"

One can readily envision the confusion which a young child must experience upon seeing sentences like this in his preprimer.

Many attempts have been made to correct this situation. Strange looking alphabets have been devised to bring stability into the language. Some linguists have advocated the teaching of lists of regularly spelled

words, thus emphasizing grapheme-phoneme stability, but these usually ignore sensible reading content.

The problem appears to have been that while much has been written and spoken about grapheme-phoneme consistency, few have examined this basic question: What produces this consistency? What structural unit within English words causes there to be stability in the relationship between graphic representation and oral pronunciation? The author believes this stable unit to be the closed syllable, i. e. a syllable which begins with a vowel and ends with a consonant, semi-vowel,or "silent 'e'." Such a structural unit is called a graphoneme*.

A graphoneme is a closed syllable, one which begins with a vowel and ends with a consonant, semi-vowel, or "silent 'e'."

an	ay	ate
et	ew	eme
in	ow	ike
or	uy	ole
uch		une

* The author originally referred to closed syllables within words as phonograms (The Phonogram Method, © 1963 by Virginia W. Jones), and in recent years has published reports about phonograms and their use in attacking new vocabulary. The terminology was changed and the word graphoneme devised since phonograms, according to established definitions, can also be open syllables.

Closed Syllables

Closed syllables are natural units of the English language. However, much of our spelling is based upon Latin, and since the open syllable is natural to the Latin language, many English words syllabicated according to standard dictionaries appear to be open. For example, the word terminal is syllabicated ter-mi-nal, thus producing the open syllable, mi. When the same word is viewed as being composed of graphonemes, the open syllable no longer exists - terminal*. Since we know the consonants to be fairly regular in their pronunciation and the vowels to be less regular, it would appear that it is the presence of a vowel in an open syllable which causes the difficulty. According the open syllable mi its proper phonemic value requires knowledge of the complexities of diacritical markings; according the closed syllable in its proper phonemic value causes no problem. The presence of the consonant following the vowel produces stability.

Since a graphoneme is by definition a closed syllable, it can therefore be identified as the basic structural unit which produces stability between the graphemes and phonemes in English words.

Teaching Procedures

When the Graphoneme Concept is taught in the initial period of reading instruction, the axiom to be followed is simple: Teach first those words in

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* Joos, Loyal W., The Phonogram Method, Experimental Research Series Report #127, Baltimore County Public Schools, 1964, p. 7

which stability already exists, and postpone irregularities until reading skill has been acquired to a sufficient degree that pupils can adjust to the differences which exist in word structures. Examples of the way in which this can be done are numerous:

eat	seen	cat	save
neat	green	bat	gave
seat	queen	fat	wave
(Don't teach great)	(Don't teach been)	(Don't teach what)	(Don't teach have)

When a graphoneme cluster can be pronounced in more than one way, teach only one pronunciation until a later date:

show		how		good	
	vs				vs food
grow		now		wood	

When a phoneme cluster can be represented by more than one spelling, teach only one at first:

night		kite		ate		eight	or	four
	vs				vs			vs
fight		white		late		weight	for	door

Thus we imply a generalization of one pronunciation for one spelling pattern and provide the vocabulary to make this consistent. When the time comes for duplicity or exception, pupils will have gained sufficient confidence so that the exception is less likely to result in confusion.

Identifying Graphonemes

The identification of graphonemes is a very simple procedure - merely look through the word from left to right, underlining letter clusters which

begin with vowels. To check yourself in their identification, underline the graphonemes in the following words:

beat	lamp	beat	lamp
flight	chair	flight	chair
ground	slow	ground	slow
splash	dress	splash	dress
tape	rain	tape	rain
smoke	bank	smoke	bank
brought	car	brought	car

This same procedure can be used in analyzing many stable multi-syllabic words. Can you underline the graphonemes in these words?

swaying	hampering	swaying	hampering*
willingness	continent	willingness*	continent*
carpet	walking	carpet*	walking
cigar	planted	cigar	planted*
flower	finish	flower	finish
Janet	Sunday	Janet	Sunday
insulate		insulate*	

---

* In these words, you would be equally correct if you underlined them in this fashion:

il ins arp amp ont ant

The only requirement is that the syllable be closed.

WORD FAMILIES VERSUS GRAPHONEMES

Students of reading theory will be quick to recognize an apparent similarity between word analysis through graphoneme identification and familiar "word family" approaches. The similarity is, however, only coincidental, for graphoneme analysis extends beyond the limited phonetic relationships existing in "Nan can fan Dan," or "The fat cat sat on the mat." It should be acknowledged that such monotonous rhyming occurs in first grade vocabulary because this early reading vocabulary is largely monosyllabic. The Graphoneme Concept avoids this pitfall through the implementation of two important procedures, spacing and the introduction of multisyllabic words.

Spacing

Spacing is the key to the problem of the "fat cat," for spacing utilizes grapheme-phoneme correspondences that are natural in the flow of language. Although pupils may practice reading many words using the stable graphoneme <u>at</u>, forcing the use of several words of such identical structure within one thought unit defeats the real purpose of learning to read. Meaning and intelligence must not be replaced by a desire to repeat as many structurally related words as possible in the shortest amount of time. Usually only two, and never more than four words containing the same graphoneme should occur in any one passage.

Multisyllabic Words

Pupils learning graphoneme analysis are moved as quickly as possible from monosyllabic words (where the graphoneme always occurs in lateral position in the word) to words containing more than one syllable. Thus pupils learn that an is a stable unit whether it occurs in initial, medial, or lateral position.

Initial - animal

Medial - advancing

Lateral - ran

Pupils who have learned to read the words run, and her, are expected to independently read the new word hunter. If in and show are known, the word window is not pre-taught. Restricting the initial reading vocabulary of beginning readers to include largely just those words which exemplify the Graphoneme Concept enables pupils to more quickly and securely assume independence in word attack. This combination of spacing techniques and an immediate shift to multisyllabic vocabulary enables the production of reading text which exemplifies a smooth and natural flow of language.

REPRESENTATIVE LIST OF GRAPHONEMES

ab	aim	an	are	at
ace	ain	ance	ark	atch
ack	air	and	arm	ate
act	ait	ane	arn	ave
ad	ake	ang	arp	aw
ade	alk	ank	art	ax
aft	all	ant	ase	ay
ag	alt	ap	ash	aze
age	am	ape	ask	
aid	ame	ar	ass	
ail	amp	ard	ast	

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ead	eat	een	elp	esk
eak	eck	eep	elt	ess
eal	ed	eer	em	est
eam	eed	eet	en	et
ean	eek	eg	end	etch
eap	eel	ell	ent	ew
ear	eem	elm	ep	

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ib	ig	ince	irt	itch
ibe	ike	ind	is	ite
ick	ile	ine	ise	ive
id	ill	ink	ish	ix
ide	ilt	int	isk	ize
ife	im	ip	iss	izz
iff	ime	ipe	ist	
ift	in	ire	it	

---

oach	obe	oll	oop	orn
oad	ock	om	oor	ort
oak	od	ome	oot	ose
oal	ode	on	op	ot
oam	oft	one	ope	otch
oan	og	oof	or	ote
oap	oid	ook	orb	ow
oast	oil	ool	ord	owe
oat	oke	oom	ore	ox
ob	ole	oon	ork	oy

REPRESENTATIVE LIST OF GRAPHONEMES (Continued)

ub	ug	ume	ur	ush
ube	uge	un	ure	usk
uck	ule	und	urn	uss
ud	ull	une	urt	ust
ude	ult	unk	us	ut
uff	um	up	use	ute
				uzz

PART II

In the Alaskan Reading and Language Development Project, the author had an opportunity to design a program and write materials based entirely upon the research related to graphonemes. But is the concept transferrable to other programs, to other reading materials? While a participant in the Tri-University Project at the University of Nebraska, Lincoln, Nebraska, the author worked in conjunction with Evelyn Wiggins, a fellow participant, to explore this question. The paper which follows is the result of this investigation.

UTILIZING THE GRAPHONEME CONCEPT IN TEACHING THE INDEPENDENT DECODING OF READING VOCABULARY*

Recent research has shown the necessity for placing increased emphasis upon the teaching of decoding skills during the period of initial reading instruction.[8] Since the graphoneme concept described in the previous paper presents an effective way of utilizing the stability which exists within the structure of English words in promoting independent decoding of unknown vocabulary, it appeared to the writers that a need existed to utilize this concept to the optimum by making it available to classroom teachers in concrete ways. The problem was: How can pupils engaged in basal reading programs be taught decoding skills utilizing the graphoneme concept?

The following procedures were employed in this investigation:

1. The writers examined Dechant's list[9] of the 149 words common to the most popular basal reading series for primary grades. (See Table 1.) Four basic questions were posed regarding them:

    a. What percentage of these word structures were stable in their phoneme-grapheme correspondences?

    b. How many graphonemes (closed syllables) could be identified within these word structures?

c. If the Graphoneme Concept were used in the analysis of these words, how many additional monosyllabic words (that could be expected to be found within the listening and speaking vocabularies of primary grade children) could be generated?

d. Approximately how many multisyllabic words could be generated whose components would consist of these same graphonemes?

2. Once the above data was accumulated, the writers turned their attention to the development of suggested teaching procedures which would enable a primary grade classroom teacher to utilize these findings.

Table 1

Dechant's list of the words most common to the popular primary basal reading series consisted of the following 149* words:

a	farm	laugh	said	walk
about	fast	let	say	want
again	find	like	saw	was
all	for	little	see	water
am	from	long	she	way
and	fun	look	so	we
are	funny		some	went
as		make	something	were
at	get	man	soon	what
away	girl	many	stop	when
	give	may		where
baby	go	me	take	white
back	good	mother	thank	who
ball	good-by	Mr.	that	will
be		must	the	wish
big	had	my	them	with
birthday	happy		then	
black	has	night	there	yellow
blue	have	no	they	yes
boat	help	not	this	you
boy	her	now	three	your
but	here		time	
	him	of	to	
call	his	on	too	
came	home	one	took	
can	house	open	toy	
come	how	out	tree	
could		over	two	
cow	I			
	in	party	up	
day	is	play	us	
did	it	put		
do				
dog	jump	rabbit		
down	just	ran		
duck		red		
	kitten	ride		
eat	know	run		

*Dechant refers to his list as 150 words, but examination reveals the the repetition of the word "now."

Further examination of Dechant's word list yielded the following additional data:

1. One hundred words on this list were monosyllabic and contained 69 graphonemes.

2. Eighteen words on the list were polysyllabic words which were stable (in whole or part) and in these could be identified 11 graphonemes not found in the 100 stable monosyllabic words.

3. Thus, the 118 stable words contained a total of 80 graphonemes.

    a. Seventy-one of the 80 graphonemes evidenced two-way stability (i.e., one graphoneme represented one phoneme).

    b. Eight graphonemes evidenced duplicity in phonemic reproduction.

        wind - find; some - home; how - show;

        have - gave; what - at; down - grown;

        four - our; here - there - were

    c. There was only one evidence of duplicity in graphemic reproduction.

        night - white

4. Thirty-one words in the list could not be decoded using the graphoneme principle, and therefore the writers considered these to be sight words.

An examination of these statistics reveals the very significant fact that 79.1% of the vocabulary in Dechant's list can be decoded by grapho-neme identification.

The next procedure was to classify these 80 graphonemes according to their vowels:

a	e	i	o	u
ab	arm	eat	ig	ite	out	ome	uck
ad	at	et	in	ill	oat	ouse	ump
ag	as	elp	ing	ish	or	ow	un
ain	ast	en	ind	ith	om	own	up
all	ack	ent	ir	ight	ood	ook	us
alk	ake	es	irl	id	ot	oy	ust
an	ave	ed	ive	ide	oth	ould	ut
and	aw	em	im	is	on	og	
ank	am	er	ime	ike	oon	ong	
ap	ame	ere	it		op	our	
ar	ay	ey					
		ell					

The writers next determined how many monosyllabic words could be generated from this available group of 80 graphonemes. No effort was made to discover all such words, but rather, the investigators merely listed those new words which readily came to mind, and which could be formed by initial consonant substitution. These were classified according to their beginning vowel:

In the (a) group - 217

In the (e) group - 73

In the (i) group - 127

In the (o) group - 108

In the (u) group - 35

560

Such an informal procedure may appear at first reading to be something less than scholarly; however, since the purpose of the investigation was

to make this concept of decoding as simple as possible for any classroom teacher to use, this informality was felt to be an advantage. There was, however, one important criterion used in the generation of these words - namely that only words would be listed which the writers felt to be ones which would already be in the listening and speaking vocabularies of most primary grade children.

It was apparent that a group of 80 familiar structural elements (graphonemes) could readily yield a total of 560 words which would probably be within the listening and speaking vocabularies of primary grade children. Since this represents a ratio of seven-to-one, the writers felt that the identification of these graphonemes would unquestionably be valuable in teaching young children to independently decode words.

Attention was next directed to the possible fruitfulness of employing these procedures to analyze multisyllabic words. The writers suggest that words of more than one syllable can be handled in two different ways: The teacher can encourage pupils to generate such words through encoding procedures, and the more familiar decoding procedures can be used as well. Either encoding or decoding can be used in analyzing any of the following representative multisyllabic words:*

---

*Once again, the writers made no attempt to list all of these words which occur in the language and which might be in the listening and speaking vocabularies of primary grade children. This list therefore is merely representative of those multisyllabic words, every part of which consists of one of the 80 graphonemes identified in Dechant's list.

contain	convent	maintain	discontent
dinner	cluster	banker	blanket
consistent	supper	command	commander
forbidden	contented	enjoyment	entertain
installment	gunpowder	imprison	improper
lemonade	interstate	investor	lavender
temper	operate	organ	permanent
blemish	remember	September	member
window	armor	kitten	winter
princess	balloon	orphan	powder
blended	prisoner	promote	thunder
visitor	thunderstorm	thundershower	understand
mainspring	wallet	wonder	contended
		sentimental	

Teaching Procedures

Teachers who wish to instruct pupils in decoding procedures utilizing the graphoneme concept should set aside approximately 15 minutes per day for this purpose. A typical period of this kind might consist of the following procedures:

1. The teacher would select from the basal reading vocabulary two or three words which are known to the children, and which he has decided can best be used for this purpose.

run and her*

2. From each of the words chosen, generate a list of familiar monosyllabic words.

run	and	her
fun	sand	
gun	land	
bun	grand	
sun	band	
spun	hand	
	brand	

3. Show pupils the principle of extending the matrix (the vowel-consonant pattern) pointing out the stability in grapheme-phoneme relationship.

ar	art	ark	arm	ard	arn
car	cart	bark	harm	hard	barn
far	dart	dark	farm	yard	yarn
star	start	mark	charm	card	darn

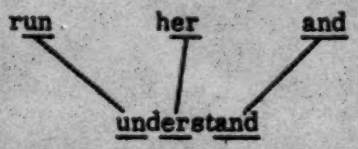
* The pronoun "her" will not generate any familiar monosyllabic words, but er is one of the most useful graphonemes because of its frequent occurrence in multisyllabic words.

an	and	ant
can	band	plant
man	sand	pant
ran	hand	slant
en	end	ent
ten	bend	went
when	send	cent
then	mend	spent

4. Initiate encoding procedures which begin with the presentation of known monosyllabic words (with graphonemes underlined) whose matrices (graphonemes) can be identified in unknown multisyllabic words. For example:

"Can you read 'run'?" "Can you read 'her'?"

"Can you read 'and'?" "Then you can read:"



"Can you read 'his'?" "Can you read 'for'?"

"Can you read 'take'?" "Can you read 'sing'?"

"Then you can read:" "Then you can read:"

5. Initiate decoding procedures by which the encoding process is reversed, i.e., the multisyllabic word is introduced first, and attention is called (through underlining) to the known graphonemes in the word.

thunder hunter

winter rocket

If a pupil experiences difficulty, return to encoding procedures. For example, a pupil missing "hunter" should be shown:

On succeeding days of decoding practice as pupils internalize larger numbers of graphonemes, the variety of multisyllabic words that can be chosen for independent encoding and decoding practice becomes greater.

Conclusion

It is apparent that the graphoneme concept can be implemented in programs of beginning reading instruction without the necessity of specially prepared reading materials. Since such a high degree of stability was found to be present within the structures of the 149 words common to the basal reading series most often found in primary grade classrooms, these words can form a body of structural elements which, when taught to pupils, can be of significance in teaching the skills of decoding. It is suggested that teachers who wish to follow these procedures first become thoroughly familiar with the Graphoneme Concept, and then use the procedures suggested in this paper to initiate this kind of word analysis with pupils. Once teachers and pupils have learned to identify graphonemes, they will find it possible to independently decode most English words.

PART III

The investigation into the role of the graphoneme as a useful and readily identifiable matrix within the structure of English words, is an on-going process. The paper which follows describes a recent study which surveyed the vocabulary of elementary school children in an effort to determine which graphonemes should be taught in a program of initial reading instruction. Frequency of occurrence was equated with utilitarian considerations.

OCCURRENCE OF GRAPHONEMES IN THE VOCABULARY OF ELEMENTARY SCHOOL CHILDREN

INTRODUCTION

The usefulness of the Graphoneme Concept as the prime method of word attack taught to primary grade children, has been proven. There is documented evidence that young children, taught to identify graphonemes in monosyllabic words and then taught the encoding and decoding of multi-syllabic words through graphoneme analysis, rapidly become independent readers.[10] This becomes particularly true when early reading materials are constructed which contain vocabularies stable in their grapheme-phoneme correspondence.

This study was undertaken in an effort to identify the graphonemes inherent within the structure of those English words which would most likely constitute the reading vocabulary of elementary school children. It has become increasingly apparent that such knowledge could play an important role in determining which words should be included in the content of reading materials designed for initial reading instruction. The Chall study clearly delineated the need for the early teaching of decoding procedures.[11]

This study attempts to identify the stable structures (graphonemes), that would logically speed up the process of independent decoding. Its findings have implications for all authors of readers, regardless of decoding methods

to be employed.

The following general assumptions related to the decoding of English words were first considered:

1. Children can best learn to read when the reading vocabulary is stable in its grapheme-phoneme correspondence.

2. The English language is approximately 87% stable in its grapheme-phoneme relationships,[12] and it is this body of stable vocabulary that should constitute initial reading experiences.

3. Written language is, at best, only an approximation of speech.

4. Presently accepted syllabic divisions of words were decided arbitrarily and vary from dictionary to dictionary depending upon the lexicographer employed.

   a. The "rules" of syllabication serve little purpose in initial reading instruction.

   b. The division of words into syllables frequently results in the formation of open syllables.

   c. Syllabic divisions furnish poor clues to independent decoding without the presence of complicated systems of diacritical markings. The finite distinctions which characterize these markings and the fact that they vary from dictionary to dictionary render them of little value to the young reader.

5. The closed syllable is the natural unit of the English language. The matrix here is a vc pattern, and it is this unit, called a graphoneme, which exemplifies the stability in English words.

DESCRIPTION OF THE STUDY

Problem:

Which graphonemes occur with sufficient frequency in the vocabulary

of elementary school children to make their teaching appear necessary in enabling young children to independently decode English words?

Hypotheses:

1. The graphoneme is a readily identifiable matrix within the structure of English words.
2. A frequency distribution of graphonemes occurring in the vocabulary of elementary school children would provide priorities for teaching purposes.

Delimitations:

The source of the vocabulary for this study was the Thorndike Barnhart Beginning Dictionary.[13] This reference was used since it is believed to be the dictionary most commonly used in elementary schools at the primary grade level. This book is usually used by pupils in the third grade, and frequently provides pupils' first dictionary experience.

In addition, the study ignores word choices based on content considerations.

Basic Assumptions:

1. The teaching of graphonemes promotes pupils' ability to decode English words.
2. The graphoneme (i. e., the vc pattern) is a more readily

identifiable unit than the standardly accepted notion of the syllable.

3. Graphoneme analysis of every tenth word in the Thorndike Barnhart Beginning Dictionary would yield data indicating those graphonemes most frequently occurring in the vocabulary of elementary school children.

4. Beginning reading materials designed to include the findings of this study could be instrumental in promoting early independence in decoding English words.

Definition of Terms:

Graphoneme: A graphoneme is a closed syllable, one that begins with a vowel and ends with a consonant, semi-vowel, or silent "e."

an	ay	ate
it	ow	ike
ar	ew	ume

Matrix: The smallest identifiable unit within the graphoneme which retains the characteristics of the entire graphoneme.

art - the matrix is ar

end - the matrix is en

Duplicity: The term "duplicity," as used here, refers to those times when one spelling pattern can produce more than one speech sound.

ow - /aw/ - (cow)

ow - /ow/ - (snow)

or when one speech sound can be represented by more than one spelling.

ight - /ay/ - (night)

ite - /ay/ - (kite)

The linguistic notations of the vowel sounds are made here according to the "Modified Key to the Trager-Smith System of Phonemic Notation."[14]

Closed Syllable:	A syllable which begins with a vowel and ends with a consonant, semi-vowel, or silent "e."
Open Syllable:	A syllable which begins with a consonant or semi-vowel and ends with a vowel; a single vowel sound as a syllable.
Variant Endings:	The term as used here is synonymous with inflectional endings (forms) of words.
Negative Graphonemes:	This term refers to those graphonemes identified which are not given the phonemic value one might expect. For example, "ad" in a word like "admiration" is considered to be negative because of this inflected form of the root word "admire."

PROCEDURES

1. The 1962 edition of the Thorndike Barnhart Beginning Dictionary was examined and every tenth word marked.
2. The words thus identified were listed, yielding a total of 1,432 words. (The total number of words in this dictionary is 14,327.) This constitutes the sample, which can be found in Appendix 1.

3. Each word on the resultant list was analyzed according to graphonemes.

a. The vc pattern in each word was underlined.

b. A rank distribution was made from greatest to least frequency of occurrence as shown in Table 2; the cut-off point was determined to be ten.

c. All existing graphonemes were grouped according to their beginning vowels (a, e, i, o, u, y) and the actual numbers of occurrences noted for each. (Appendix 2)

d. The phonemic value of the vowel sound was noted, e.g., ear - Was it /iyr/ as in "hear"; /eyr/ as in "bear"; /ər/ as in "earth"; or /ar/ as in "heart?"

e. Graphonemes requiring the placement of a macron over the vowel sound were noted separately. (Appendix 3)

f. Open syllables were identified. (Table 3)

g. Variant endings were noted as a separate item. (Table 4)

TABLE 2

RANK DISTRIBUTION OF GRAPHONEMES
IDENTIFIED IN SAMPLE

Times Occurred	Graphoneme	Phonemic Value of Vowel*	Example
160	er	/ėr/	her
78	in	/in/	win
75	en	/en/	ten
71	or	/ôr/	for
51	an	/an/	can
45	on	/on/	on
39	un	/un/	run
37	ate	/āt/	late
37	it	/it/	hit
35	et	/et/	pet
34	is	/iz/	his
33	at	/at/	cat
33	al	/al/	Al
33	ic	/ik/	panic
32	ess	/es/	dress
30	ing	/ing/	sing
28	ent	/ent/	went
28	es	/es/	yes
27	om	/om/	Tom

TABLE 2 - Continued

Times Occurred	Graphoneme	Phonemic Value of Vowel*	Example
24	ec	/ec/	record
23	ab	/ab/	cab
22	ap	/ap/	cap
22	ed	/ed/	red
21	im	/im/	him
21	al	/ə̈l/	final
20	ar	/är/	car
20	em	/em/	them
20	id	/id/	hid
20	ul	/ul/	ultimate
18	el	/el/	elevator
17	ac	/ak/	accent
17	as	/az/	has
16	am	/am/	am
16	ex	/eg/	exit
15	il	/il/	civil
15	if	/if/	if
15	ur	/ər/	fur
14	ay	/ā/	play
14	um	/um/	hum

TABLE 2 - Continued

Times Occurred	Graphoneme	Phonemic Value of Vowel*	Example
14	us	/us/	bus
13	ad	/ad/	bad
13	ish	/ish/	wish
13	ol	/ol/	olive
12	ăr	/ar/	arid
12	op	/op/	hop
11	ant	/ant	plant
11	ep	/ep/	step
11	ig	/ig/	pig
11	ill	/il/	will
11	ow	/o/	snow
11	ure	/ůr/	sure
10	ag	/ag/	bag
10	ef	/ef/	chef
10	ip	/ip/	lip
10	ōs	/ōz/	posing

An examination of the graphonemes thus identified leads to some interesting observations. For example: er occurs in only one mono-

syllabic English word (her), yet it occurred with the highest frequency of all graphonemes; affixes appear important in that they apparently account for much of the stability in grapheme-phoneme correspondence; one might have expected eck (which occurred only three times in the sample), or ick (six times) to be more common than ec (24 times) or ic (33 times), but such was not the case; only two examples of duplicity occurred in this high frequency count (al and ar), both exemplifying one grapheme producing two phonemes, while there were no instances of the reverse - one phoneme represented by two graphemes.

TABLE 3

OPEN SYLLABLES

y (ĭ) - 99	o͞o - 3
le - 48	e͞e - 3
ĭ - 12	le (lĭ) - 2
a (ᵾ) - 12	y (ī) - 2
o͞ - 10	i͞e - 2
a͞ - 9	ly (lĭ) - 2
i͞ - 10	u (o͞o) - 1
u͞ - 8	e͞a - 1
e͞ - 5	ue (o͞o) - 1
i (e͞) - 5	

TABLE 4

VARIANT ENDINGS

tion - 37	ial - 3
ious - 8	ient - 3
sion - 9	ian - 1
ion - 3	ean - 1

TABLE 5

SUMMARY OF ANALYSIS OF SAMPLE

Number of Words in Sample	Number of Syllables in Sample	Number of Closed Syllables (graphonemes) in Sample	Number of Open Syllables in Sample
1,432	3,101	2,866	235

1. The words in this sample averaged 2.16 syllables, 2.0 of which were closed.

2. 92.4% of the total number of syllables was closed.

3. An examination of the open syllables (Table 3) reveals that the majority of these occurred in two endings: "y" and "le."

CONCLUSIONS

The following generalizations, on the basis of the data acquired, can be assumed to be valid. (A summary of this data can be found in Table 5.)

1. There exists within the structure of English words a body of graphonemes which occur with sufficient frequency to warrant their teaching. (See Table 2)
2. Priorities can be established to further the utility and reliability of word choice in initial reading vocabulary.* For example, the pronoun "her" should be taught early, since the graphoneme er occurred the greatest number of times in the 1,432 words analyzed.
3. Duplicity in graphonemes does not occur as often as one might suspect.
4. The short vowel phoneme occurs more often than any other.
5. On the basis of this sample, more closed than open syllables can be identified.

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* It must be kept in mind that the author is dealing only with the selection of useful vocabulary for the promotion of independence in decoding. There are other important criteria for the selection of initial reading vocabulary. For example, "organ" would be a word easily decodable, since, according to this study, or occurred 71 times and an occurred 51 times, while ith as found in the word "with" occurred only once. However, "with" is certainly a more useful English word than "organ" because of its frequency of use.

6. Open syllables occur most often in lateral position in English words. (See Table 3)

7. Exceptions to graphoneme analysis most frequently occur in variant endings. The root forms of these same words are usually quite stable.

SUMMARY

The data furnished by this study have implications for all who would write materials for initial reading instruction if their aim is to rapidly promote pupils' ability to independently decode English words. Any materials so constructed would appear to be instrumental in the acquisition of this reading skill.

Furthermore, the study lends validity to the assumption that the graphoneme is a useful matrix to be recognized within a word. The ratio of open versus closed syllables is greater than ten to one in favor of the closed syllable. The infrequent occurrence of duplicity and of negative graphonemes implies a stability inherent in this procedure.

The study also enforces the concept of movement away from monosyllabic words and toward the early introduction of multisyllabic vocabulary. Pupils should initially be taught monosyllabic words containing graphonemes of high frequency as identified within the structure of English words. They then should be able to use this knowledge as an important tool in independently

decoding multisyllabic vocabulary. This transference should occur with minimal difficulty.

While the intent of the study was not to enforce the Graphoneme Concept, the resultant data verify previous findings. It would appear that if we were to:

1. use an initial reading vocabulary employing those graphonemes most frequently found in English words,
2. teach pupils to identify graphonemes in English words,
3. teach the decoding of some words through the use of the macron,
4. teach pupils a small body of high frequency open syllables at the ends of English words, and
5. teach pupils the effect of certain variant endings of English words,

we could, coupled with a program of phonics instruction aimed at teaching consonant grapheme-phoneme correspondences, greatly advance pupils' early reading achievement.

APPENDICES

APPENDIX 1

WORD SAMPLE

abbott
abject
abominable
absent
abstract
accelerator
accident
accomplish
accurate
acknowledge
acquit
actress
adaptation
adhesive
admiral
adopt
advance
adverse
aerial
affection
afloat
afterward
aggregate
ago
ahead
aircraft
airway
album
alien
alley
ally
aloof
alter
alum
amber
America
among
an
and
angler
animate
announce
answer
antenna
antidote
anxious
apart
apology
appeal
appliance
apprehend
approximate
Arabia
arc
arctic
arid
arm
armpit
array
art
artistic
ashamed
asparagus
assassinate
assignment
assume
astonishing
at
atom
attain
attire
audacious
August
authorize
available
aversion
avowal
awful
axis

backbone
bacteria
bail
balance
ballad
ban
banjo
Baptist
bard
bark
barrel
basement
bass
bathroom
battlefield
bazaar
bean
beautiful
becoming
bedtime
bees wax
befriend
begun
behold
bell
belt
benevolent
beset
bestow
betroth
beware
bicuspid
bill
biography
bishop
black
blade
blaze
blessing
blister
blockhouse
blossom
blubber
bluing
board
bob

boil
bombardment
boo
born
bottom
bound
bow
box
brace
bramble
brawn
breast
breeze
bride
brigand
bring
broaden
bronchial
broth
browse
brutal
buckwheat
bugbear
bulge
bullfinch
bun
buoy
burlap
burst
bust
butter
buy
bystander

cactus
calculate
call
came
Canada
candor
cannonade
cantankerous
cape
capsize
car
cardboard
careless
carnival

carrot
cascade
casserole
catalpa
catechism
catsup
cavalcade
cayuse
celery
censer
central
certain
chair
chameleon
chant
char
charm
chat
checkbook
cheerless
chess
chicle
children
China
chivalrous
chop
Christ
chronicler
churl
cinnamon
circumference
citizenry
civilization
clamor
clarion
classroom
cleanness
cleave
clerk
clime
cloak
closeness
cloudless
cluck
coachman
coat
cobweb
cocoa

coffer
cold
collector
colonization
colossal
comedian
comical
commencement
commodity
communication
company
compatible
complacency
complexity
composite
compromise
concede
concern
conclude
condense
confederacy
confident
conform
congregate
Connecticut
consecrate
considerable
console
constant
constrict
consumption
contempt
contestant
continuous
contradict
contrive
convention
convict
cool
copper
corkscrew
cornet
corporal
correspond
corselet
cottage
council
counteract

county
court
covenant
cow
cowhide
crab
cram
crate
craze
creator
crept
crib
crisis
crockery
cross
crossways
crucial
cruiser
crustacean
cuckoo
cull
culvert
curator
currant
curtsy
cut
cylindrical

dahlia
dally
damsel
dapper
dart
dauntless
deacon
dear
debtor
decency
decision
decorum
deepen
defender
deficient
deft
delegation
delirium
demand
demure
dental

dependent
depth
descend
deserve
desolate
dessert
detachment
detestable
devoid
diacritical
diameter
did
difficult
dignity
dimension
dinner
dipper
dirge
disagreeable
disaster
discolor
discouragement
discriminate
disfigure
dishonor
disloyal
disobey
display
disquiet
dissipate
distillation
distribute
diver
divisible
dock
does
dole
domesticate
done
dormant
double
dove
downhill
dozen
drake
drastic
dray
dredge
drew

drip
drop
drudge
drunken
duck
duke
dunce
dusk
dwelling
dynasty

earl
earth
east
eaves
economic
edge
educate
effectual
Egypt
either
elbow
electrify
elevate
ellipse
elusive
embattled
embroidery
eminence
empire
emulation
enchantress
encumber
endosperm
energy
engineer
engulf
enlist
enrollment
enterprise
entice
entry
envoy
equalize
equivalent
erosion
escort
essential
eternal

evaporate
eventual
everything
exact
exasperation
except
excitement
excuse
exhale
existence
expectation
experiment
exploit
expound
extent
extraordinary
eye

fable
factor
failure
faithless
famed
fanciful
farm
farthing
fastness
fathom
faun
fearless
fed
feign
feminine
ferret
festal
fever
fiddler
fiendish
fiftieth
file
filter
finch
fir
fireman
first
fishhook
five

flake
flashlight
flaunt
fled
flew
flight
flirt
Florida
flower
fluster
foal
foil
follow
foolish
footpath
forbearance
ford
forego
foremost
foretold
forgetfulness
form
forsaken
fortify
fossil
foundry
fowl
frailty
fraternal
freeze
frequent
friction
fright
frock
frosting
fruitless
fullness
fungus
furniture
fuse

gait
gallery
gander
garden
garret
gate

gauze
gelatin
genie
gently
germ
giant
gill
gipsy
girt
glade
glass
glimmer
glorious
glutton
goat
goddess
goldfish
goodly
gopher
gossip
grab
graduation
grandchild
grange
grapple
gratification
gravity
greatly
greet
grievance
grindstone
grocery
ground
grown-up
guard
guilt
gully
gunwale

had
hair
halfway
halt
hamper
handkerchief
hanger
happy

hardly
harm
harpoon
hast
hateful
haven
hay
hazel
headlight
healthful
heartbroken
heater
Hebrew
height
helm
hem
herb
hereby
heritage
hesitate
hidden
highway
him
his
hitter
hobnail
hold
holster
homespun
honeycomb
hook
horde
horrify
hose
hostess
hourly
hove
huddle
humanity
humor
hundredth
hurl
husband
hut
hygiene

Idaho

idleness
ignoble
illiterate
illustrate
imagine
immemorial
immortal
impassable
imperative
impetuous
importation
impression
imprudent
inaccessible
inauguration
incidentally
include
inconsistent
incredibly
indelible
indicate
indignant
individual
induce
ineffectual
inexhaustible
infant
inferiority
inflammable
information
ingratitude
iniquity
injury
inmost
innovate
insane
insert
insistence
install
instinctive
insufficient
intake
intend
intercede
interference
intermingle
interpreter

interstate
intimate
intrepid
inundate
invent
investigator
invoke
ire
irresolute
isle
Italian
ivory

jade
January
jay
jellyfish
Jesus
jeweler
job
joke
journalist
jubilant
jugular
juncture
just

keenness
kept
keynote
kiln
kindergarten
kingly
kith
kneel
knighthood
knotty

lack
ladybug
lameness
landlady
lantern
larder
lash
late
latter

laundry
lawmaking
layer
leaf
leant
lease
lecture
left
legion
lemonade
lent
let
liberal
lichen
life
lifetime
lighthouse
likelihood
limb
limpid
links
liquid
literate
livelong
lizard
loath
location
locust
logic
long
loom
lopsided
lost
lovable
lowly
lucky
luminous
lurid
lye

machinist
made
magistrate
magnitude
mailman
maintain
maker

mallard
man
manful
manicure
manor
manuscript
march
mark
maroon
marshy
masculine
message
mat
mathematician
maul
mayhap
meager
meanness
mechanically
mediate
medium
mellow
memorize
mental
mercury
merrily
message
meter
mettle
microscope
middy
midway
migration
milk
milliner
mind
minion
mint
mire
mischievous
mishap
miss
mist
misty
mixer
mode
Mohammedan

molding
momentary
monk
monstrous
moonbeam
moral
morose
mosque
motherly
motorcycle
mound
mourn
move
mown
muddle
mule
mum
murderer
mushroom
muskrat
mute
my

namesake
nasal
natural
nausea
nearby
necessity
needlework
neigh
nest
neutron
New Jersey
New World
nickname
nightmare
ninth
nocturnal
nominee
noontide
northeast
northwest
notch
notorious
now
nuisance

nurse
nymph

obedience
obligation
obscure
obstacle
occasional
ocelot
odds
offender
offset
oil
olden
omelet
oneself
onward
operate
opposite
oral
orbit
ordinarily
organize
originate
ostentatious
ourself
outcast
outermost
outlaw
outpost
outskirts
outwit
overcame
overflow
overheat
overlord
overseas
overstep
overweight
oxbow

pad
pagoda
pair
palfrey
palpitate
panda
pantry
parable
paralyze
pardon
parka
parsnip
particle
partridge
passion
pasteurize
pate
patient
patter
paving
peaceful
pearly
peculiar
peek
pelican
pence
penitence
pension
peppermint
perch
perforate
periodic
permission
persecute
personal
pertain
pester
petroleum
pharmacist
Philippine
phonetic
physically
pick
picture
pig
pike
pillar
pincushion
pinto
pistol
pitfall
placid
planet
plastic
player
plea
plentiful
ploughman
plumber
plutonium
pocket
point
polar
polio
poll
pompon
poodle
poppy
pore
port
portico
possessive
postage stamp
postpone
potion
pour
practicable
praiseworthy
precaution
precipitous
prediction
prehistoric
preparatory
presentable
press
presumptuous
prevailing
priceless
primary
primrose
prior
privateer
probable
proclaim
production
profile
progressive
prominence
pronoun
propensity

proposal
prospective
protein
provender
provocation
pry
publish
puffy
pulverize
punctual
punt
pure
purport
push
pyramid

Quaker
quarry
quaver
quick
quilt
quoit

racial
radical
rag
raiment
rake
ranch
rap
rarely
rather
rave
raw material
read
reality
rear
rebellious
recede
recipe
recline
reconcile
recover
recur
redouble
reek
referee

reflector
refresh
refuse
regime
regularly
reiterate
relatively
reliable
relish
remedy
remorse
renewal
repair
repel
report
reproachful
repulsive
requite
reserve
resigned
resonant
respectively
rest
restriction
retaliate
retract
revelation
reverie
revolution
rhododendron
riches
ride
rig
rightly
ring
ripe
rival
roam
robust
rod
role
romantic
roost
rosette
rouge
rouse
row

rubbish
ruff
rumble
rung
russet

sacrifice
sag
sailor
salesman
salty
sanctity
sane
sap
satellite
saucepan
savior
sawmill
scaffold
scan
scare
scent
schooling
scientist
score
scourge
scraper
scribe
scrutinize
scurry
seagoing
seaman
seaside
secluded
secrete
sediment
seemingly
seldom
selfish
semaphore
sensation
sentiment
sequel
serial
server
setting
seventy

sex
shady
sham
shanty
shatter
sheathe
sheer
shelter
shied
shiny
shirk
shod
shop
shorten
should
shower
shrill
shrunk
shy
sideline
sieve
significance
silk
silverware
simultaneous
singer
sip
site
sixtieth
skid
skinny
skylight
slake
slave
sleepless
slicker
slingshot
sloop
slow
slunk
smallpox
smit
smoky
snack
snaredrum
snipe
snowdrift
snuggle
soccer
sodden
soil
sole
soloist
someone
songbird
sorcerer
sort
sour
southerly
sovereignty
spaghetti
spanking
spasm
special
speck
sped
spellbound
Sphinx
spin
spirit
splendor
spoken
spore
sprain
springboard
spun
squad
squash
squirm
stag
stake
stamen
standpoint
stare
starvation
station
stave
steak
steed
stepfather
stew
stile
stink
stop
storm
straggle
strand
strategy
street
stricken
stringy
stroke
strut
studio
stunk
sturgeon
sublime
subsequent
substitution
succeed
such
suffering
suggest
sulk
summer
sunburnt
sung
sup
supermarket
supple
supposing
surf
surpass
surveyor
suspicion
swamp
sweat
sweetish
swiftness
switch
swum
symmetrical
syrup

tact
taint
tall
tangible
tape
tarantula
tartan

tattle
taxi
teamwork
teepee
television
temperature
tenacious
tenderness
tension
terminus
territory
tetanus
thankless
thee
theology
therein
thermostat
thickly
think
thistle
those
thrasher
threshold
throng
thumb
thus
ticket
tie
tiller
timothy
tinware
tired
toast
toil
toll
ton
took
topic
torment
tot
toughen
towel
trace
trademark
trail
trance
transgress
transom
trappings
tread
treaty
trencher
tribe
tricolor
trinket
trivial
tropical
trousers
true
trustful
tub
tuition
tuneful
Turk
turpentine
tweed
twill
two
typify

unaccented
unavoidable
unbolt
uncertain
unconstitutional
underclothes
underline
undertaker
undisputed
unduly
unequal
unfamiliar
unfortunate
unguent
unheeded
unify
United States
unkindly
unlimited
unmindful
unobserved
unprepared
unremitting
unsatisfactory
unsettle
unspeakable
untie
untrue
unwholesome
unwound
upkeep
uproar
upturn
us
usher
utter

vagabond
valise
vane
varied
vastness
vehement
vendor
ventilation
verdant
verse
vestige
vial
vicinity
vigil
villain
vineyard
violet
virtue
visionary
vivacious
vociferous
voluble
vouch
vying

wager
waiter
wall
wander
warden
warmth
wary
wasteful
watercourse

waterway
way
weakling
weariness
web
weed
weft
wellborn
wept
westwards
whatever
when
wherein
whetstone
whimsical
whisk
whiten
wholesale
why
widen
wigwag
will
win
windmill
wing
wintergreen
wise
wither
wives
wolverine
wonderful
woodcraft
woodwind
wording
workmanlike
worry
worthy
wrangle
wreck
wretched
write
wrought

yard
yearling
Yellowstone
yielding

you
youth

Zeus
zone

APPENDIX 2*

OCCURRENCE OF GRAPHONEMES BEGINNING WITH "a"

an-51
ate-37
at-33
al-33
ab-23
ap-22
**at-21
al (ul)-21
ar-20
ac-17
as-17
am-16
ay-14
ad-13
ăr-12
ant-11
ag-10
and-8
ance-8
are-8
ail-8
ade-8
ake-7
act-7
āt-7
all-7
ain-6
all (al)-6
ard-6
av-6
air-5
ack-5
āk-5
ath-5
aw-5
ash-4
ass-4
ast-4
āv-4
arm-4
ard (erd)-4
ar (er)-4
age-4
ame-4
ark-3
ank-3
ave-3
ād-3
āc-3
ah (uh)-3
ale-3
ax-3
ām-3
art-3
ane-3
arc-2
aug-2
ar (or)-2
ag (ug)-2
ag (aj)-2
af-2
ace-2
**ac-2
ac (as)-2
āb-2
aim-2
ait-2
aze-2
al (all)-2
ang-2
ape-2
aph-2
ās-2
ac (ace)-1
aar-1
ach (atch)-1
ach (ush)-1
ad (od)-1
az-1
ayh (ā)-1
auze-1
auth-1
aunt-1
aus-1
aund-1
awn-1
aul-1
aer-1
aft-1
āg-1
ahl (ul)-1
ain (un)-1
aint-1
aise-1
aith-1
āl-1
all (ul)-1
alf-1
ăz-1
alt-1
amp-1
amp (omp)-1
an (ahn)-1
ange-1
aord (ord)-1
āp-1
ăr-1
arch-1
**as-1
asm-1
aste-1
at (uh)-1
at (ut)-1
ate (ut)-1
ath (ahth)-1
auc (aus)-1
aud-1

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*On occasion, phonetic spelling follows the graphoneme to illustrate differences in the phonemes produced.

**Negative graphonemes.

OCCURRENCE OF GRAPHONEMES BEGINNING WITH "e"

er-160
en-75
et-35
ess-32
es-28
ent-28
ec-24
ed-22
em-20
el-18
ex-16
ep-11
ef-10
ence-9
ew-9
est-9
ell-8
ev-8
ear-6
eed-6
end-6
ēq-6
ēr-6
**es-6
ean-4
eat-4
eep-4
eer-4
eg-4
ept-4

er (air)-4
eam-3
eb-3
eck-3
ēd-3
ede-3
ēy-3
eet-3
eft-3
ert-3
ead (ed)-2
ead-2
eag-2
ear (air)-2
er (ār)-2
eth-2
ear (er)-2
eas-2
east-2
eek-2
erm-2
ern-2
erse-2
ēc-2
ec (es)-2
ect-2
**ed-2
ein-2
elf-2
erk-2
een-2

eeze-2
eg (ej)-2
eh (ā)-2
ēl-2
ēn-2
ēs-2
esh-2
ēt-2
eac-1
eace-1
eaf-1
eal (el)-1
eal-1
eant (ent)-1
earl (erl)-1
ear (ar)-1
ease-1
east (est)-1
eat (ate)-1
eat (et)-1
eathe-1
eak (āk)-1
eak-1
eaut (ūt)-1
eave-1
**eb-1
ēb-1
ebt-1
ec (is)-1
ech (ek)-1
edge-1
edth-1
eel-1
eem-1
ēg (ej)-1
**eg-1
ēg-1

eight (āt)-1
**eign-1
eign (ain)-1
eight-1
eigh (ā)-1
eith (ĕth)-1
el (ul)-1
**el-1
elt-1
elm-1
empt-1
**ēn-1
ense-1
eon (yun)-1
eone-1
ēp-1
**ep-1
epth-1
erb-1
ere-1
ere (air)-1
erch-1
erve-1
ete-1
ette (et)-1
eur (ur)-1
eus (o͞os)-1
eut (o͞ot)-1
eum (ium)-1
**ew-1
**ey-1
ey-1
ey (ay)-1
ey (ā̄y)-1
eye (ī)-1

OCCURRENCE OF GRAPHONEMES BEGINNING WITH "I"

in-78
it-37
is-34
ic-33
ing-30
im-21
id-20
il-15
if-14
ish-13
ig-11
ill-11
ip-10
ight-9
ive (iv)-9
ist-8
ize-7
ib-6
ick-6
ido-6
iv-6
ine (in)-5
ine-5
ir-5
ire-5
īv-5
ial (iul)-4
ime-4
ite-4

**ic-3
īc-3
ice-3
ict-3
īke-3
īm-3
īn-3
ise-3
ite (it)-3
ive-3
ibe-2
īd-2
ield-2
ign-2
ile-2
ilk-2
inch-2
īnd-2
ind-2
ink-2
int-2
ipe-2
ir (ear)-2
**is-2
īs-2
**it-2
ix-2
iz-2
īt-1

ith-1
īz-1
ian (ien)-1
iar (yər)-1
ic (is)-1
idge-1
ied-1
ied (ēd)-1
iend (end)-1
iend (ē)-1
iene (ēn)-1
ief-1
iev (ē)-1
iev (iv)-1
ieve (iv)-1
ife-1
if-1
īg-1
igh (ī)-1
ige (ij)-1
īgn-1
**il-1
**il-1
il (ul)-1
ild-1
iln-1
ilt-1
**imb-1
iem (eme)-1

inx (inks)-1
iol-1
ion (on)-1
ion (un)-1
ior (yər)-1
ipse-1
ipt-1
iq (u)-1
īr-1
ird-1
irge-1
irst-1
irt-1
irk-1
irm-1
ise (ēs)-1
ism-1
iss-1
īst-1
itch-1

OCCURRENCE OF GRAPHONEMES BEGINNING WITH "o"

or-71
on-45
om-27
ol-13
op-12
ō̲w-11
ō̲s-10
old-9
ost-8
ot-8
ō̲v-8
ow-8
ob-7
od-7
ound-7
ous (us)-7
ō̲c-6
or (er)-6
out-6
ov-6
ock-5
oil-5
ō̲l-5
ole-5
one-5
ong-5
ood-5
ort-5
os-5
ous-5

ō̲b-4
ō̲d-4
ook-4
oom-4
oon-4
ose-4
oss-4
oun-4
ox-4
oard-3
oat-3
off-3
ō̲g-3
oid-3
ō̲k-3
oke-3
ō̲m-3
on (un)-3
ool-3
ore (or)-3
orm-3
ō̲t-3
oth-3
oach-2
ō̲c (ō̲s)-2
oc-2
og-2
oit-2
oint-2
ol (ul)-2

om (um)-2
ō̲n-2
ond-2
ō̲p-2
ord-2
ork-2
ote-2
ō̲th-2
ou (o͝o)-2
oub (ub)-2
our (er)-2
our (or)-2
ouse-2
own-2
oad (aud)-1
oak-1
oal-1
oam-1
oar-1
oast-1
oath-1
oc (os)-1
ode-1
oes (uz)-1
ō̲f-1
ō̲h-1
oll-1
ō̲ll-1
olt-1
ome (um)-1
omb-1
one (un)-1
one (wh)-1
ong (ung)-1

onk-1
ood (ō̲o)-1
oof-1
oop-1
oost (o͝o)-1
oot-1
ope-1
oph-1
opt-1
**or-1
orde-1
ork (erk)-1
orn-1
orse-1
ō̲st-1
**ō̲t-1
otch-1
ouch-1
oud-1
ought-1
ould-1
ough (ō̲w)-1
ough (uf)-1
ounce-1
ourge-1
ourn-1
ourt (ort)-1
outh (uth)-1
outh (o͝oth)-1
ove-1
ove (uv)-1
ove (ō̲o)-1
owl-1
owse-1
ō̲wn-1

OCCURRENCE OF GRAPHONEMES BEGINNING WITH "u"

un-39
ul-20
ur-15
um-14
us-14
ure-11
ut-9
ub-8
up-7
ug-5
ūl-5
ust-5
ude-4
unk-4
use-4
ute-4
uck-3
uf-3
ull-3
ung-3
ūr-3
ush-3
ūt-3
ual-2
ūb-2
uc-2
ud-2
ud (o͝o)-2
ūn-2
url-2
urn-2
usk-2
**ut-2
uard (ard)-1
**ūc-1
ūc-1
uce-1
uch-1
uck (o͝o)-1
ūd-1
udge-1
uent (went)-1
uff-1
ulit-1
uis (ew)-1
uis (o͝o)-1
uit-1
uke-1
ul (o͝o)-1
ule-1
ulf-1
ulge-1
ulk-1
ult-1
ūm-1
um (uh)-1
umb-1
ume-1
ump-1
unce-1
und-1
unt-1
**uoy-1
úp (o͝o)-1
ur (er)-1
urf-1
urk (erk)-1
urse-1
urst-1
ūs-1
**us-1
uy (ī)-1

OCCURRENCE OF GRAPHONEMES BEGINNING WITH "y"

ym-2
yc-1
ye (ī)-1
yg (ī)-1
ȳn-1
ypt-1
yr-1
ys-1
yth (eth)-1
yze-1

APPENDIX 3

GRAPHONEMES REQUIRING THE USE OF THE MACRON

ā t-7	ē q-6	ī v-5	ō w-11	ū l-5	ȳ n-1
ā k-5	ē d-3	ī c-3	ō s-10	ū r-3	
ā v-4	ē y-3	ī m-3	ō v-8	ū t-3	
ā d-3	ē c-2	ī n-3	ō us (us)-7	ū b-2	
ā c-3	ē l-2	ī d-2	ō ll-5	ū n-2	
ā m-3	ē s-2	ī nd-2	ō b-4	ū c-1	
ā b-2	ē t-2	ī s-2	ō d-4	**ū c-1	
ā s-2	ē b-1	ī t-2	ō g-3	ū d-1	
ā g-1	ē g (ej)-1	ī z-1	ō k-3	ū m-1	
ā l-1	ē g-1	ī g-1	ō m-3	ū s-1	
ā z-1	ē p-1	ī gn-1	ō t-3		
ā p-1		**ī l-1	ō c (os)-2		
ā r-1		ī r-1	ō n-2		
		ī st-1	ō p-2		
			ō th-2		
			ō f-1		
			ō h-1		
			ō ll-1		
			ō st-1		
			**ō t-1		
			ō wn-1		

**Negative graphonemes.

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